1012902

PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.:—B 62 d

COMPLETE SPECIFICATION

Windshield Wiper Blade Assembly

I, WALTER DANIEL APPEL, a citizen of United States of America of Orchard Lake, Michigan, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in windshield wiper blade assemblies and more particularly to a simplified spring wiper blade backbone construction flexibly adaptable for efficient wiping of variable curvatures as well as by relatively flat portions of vehicle windshields.

The present construction presupposes a wiper actuating arm adapted to provide a predetermined total resilient pressure-loading of the wiper blade against the windshield surface appropriate to the length of the blade and curvature variations in the windshield, e.g. in the order of one ounce per inch of blade length, as well as an appropriate source of power for actuating the wiper under normal conditions. A single spring element is provided as a backbone to which is mounted a conventional flexible rubber wiping blade which together operate to distribute a centrally applied actuating arm pressure load relatively uniformly along the length of the blade throughout variations in windshield contour traversed by the wiper. Preferably the resilient backbone member is adapted for actuating arm attachment at or near the center and is constructed of spring metal or other resilient material bowed with a free contour surface having a radius of curvature less than that of the windshield traversed by the wiper assembly, together with a varying width and/or thickness of such resilient member from a maximum near the central arm attachment point to a minimum at the ends, the width, thickness and degree of free curvature being proportioned with the modulus of elasticity, total pressure load and length of blade to provide substantially uniform pressure along the length of contact between the flexible rubber wiping blade and the windshield.

In order to meet extreme conditions of variation in windshield curvature it may be desirable in some instances to taper the ends of the spring backbone element in thickness as well as in width in order to accommodate a correspondingly smaller radius of curvature while retaining appropriate width for resisting lateral drag loads without undue distortion.

Examples of the invention are illustrated in the accompanying drawings. The scope of the invention is not limited to these specific examples, but only by the appended claims.

Figure 1a is an isometric view of a spring element having uniform width and thickness and a free form parabolic curvature adapted to develop a uniform pressure when pressed against a flat surface;

Figure 1b is a similar view of such element in a partially flattened condition;

Figure 1c is a similar view of such element in a fully flattened condition;

Figure 2a is a similar view of an alternative spring element having a uniform thickness and variable width together with a free form circular arc curvature;

Figure 2b and 2c are similar views of such alternative element showing progressive deflection against a flat surface;

Figure 3a is a similar view of a second alternative construction showing a spring element with uniform width, tapered thickness and a free form circular arc curvature;

Figures 3b and 3c are similar views showing the progressive wrapping action of such second alternative spring element when pressed against a flat surface;

Figure 4 is a plan view of a preferred

[*Price 4s. 6d.*]

the windshield a minimal fraction of the total deflection. The "rate" of a spring is the ratio of load to deflection.

In accordance with a preferred feature of the invention, the backbone element is so shaped that its spring rate increases from the ends to the center substantially as the square of the distance from the ends, such effect being preferably achieved by varying either the width or the thickness in cross-section of the backbone element. This criterion may be differently expressed by stating that the bending moment set up in the backbone element preferably increases from the ends to the center as the square of the distance from each end.

These provisions, together with the resiliency of the rubber wiping blade per se in accommodating itself to some variation in pressure loading, have been found to permit a completely satisfactory and effective wiper to be constructed with the present single spring backbone element, a preferred embodiment of which will now be described.

With reference to Figures 4—6 a spring backbone element 36 of the construction illustrated in Figures 2a—2c may be adapted to carry a conventional rubber wiping blade 37 by providing a slot 38 extending almost throughout the length and terminating just short of the end 39 for accommodating a flanged rib 40 of the rubber blade projecting therethrough. The sides of the backbone may be sprung apart to facilitate attachment of the rubber blade before actuating arm attachment clip 41 is secured thereto by rivets 42 providing a permanent assembly for retaining the rubber blade 37 in position. As shown in Figure 5 the backbone 36a and rubber blade 37a have a free form circular arc curvature adapted to provide uniform contact pressure along the length of contact with a flat windshield 43 when fully depressed by the actuating arm (not shown).

Figure 7 shows a modification in detailed construction of the rubber wiper blade and attaching means in which a spring backbone element 45 similar to that of Figures 4—6 has a modified rubber blade 46 attached by bonding at 47. The modification of Figure 8 shows a similar modified rubber blade 48 similarly attached by bonding at 49 to a spring backbone 50 of the tapered thickness type shown in Figures 3a—3c.

WHAT WE CLAIM IS:—

1. A windshield wiper blade assembly including a wiper element, characterized by a flexible spring backbone element connected to the wiper element, attaching means adjacent the center of said backbone element, said backbone element having coordinated length, a cross-sectional width, thickness, modulus of elasticity and free form longitudinal curvature exceeding any subtended windshield curvature and including progressive dimensional variations providing a parabolic effect in spring rate normal to the windshield surface adapted in engagement in a normal direction against a predetermined windshield surface to make progressive "wrapping" pressure contact from ends to center as a predetermined normal pressure loading is increasingly applied through said attaching means.

2. A windshield wiper blade assembly as claimed in claim 1 characterized by said spring back-bone element having a varying width providing an increasing spring rate.

3. A windshield wiper blade assembly as claimed in claim 1 characterized by said spring backbone element having a varying effective thickness providing an increasing spring rate.

4. A windshield wiper blade assembly as claimed in claim 1 characterized by said spring backbone element having a spring rate increasing as the square of the distance inwardly toward the center.

5. A windshield wiper blade assembly as claimed in claim 1 characterized by said spring backbone element having a varying width of section from a maximum at the center to a minimum at the ends defined by substantially parabolic edge curvatures providing a spring rate increasing as the square of the distance inwardly toward the center.

6. A windshield wiper blade assembly as claimed in claim 1 characterized by said spring backbone element having a varying thickness of section from a maximum at the center to a minimum at the ends defined by substantially uniform linear tapers providing a spring rate increasing as the square of the distance inwardly toward the center.

7. A windshield wiper blade assembly constructed and adapted for operation substantially as described herein with reference to and as illustrated in the accompanying drawings.

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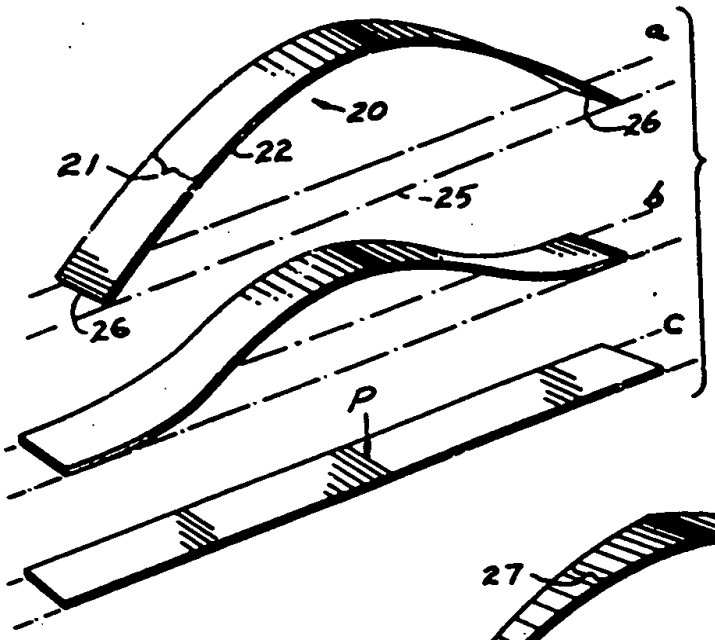
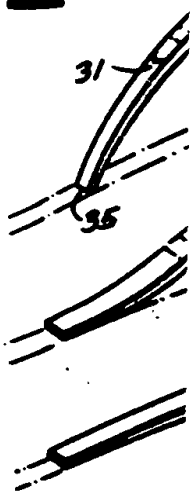


FIG. 1



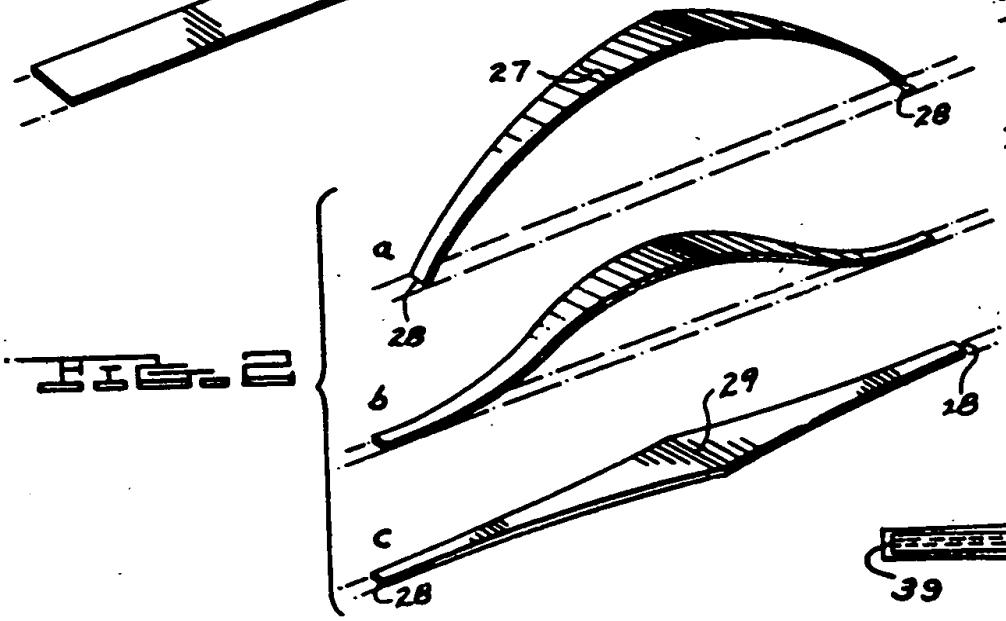
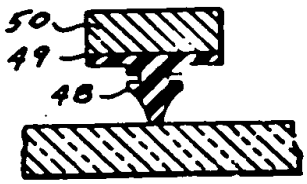


FIG. 2

FIG. 8



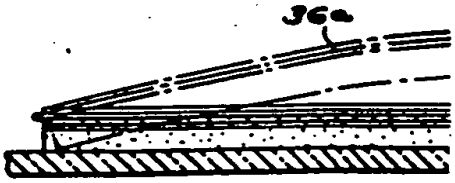


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FIG. 1

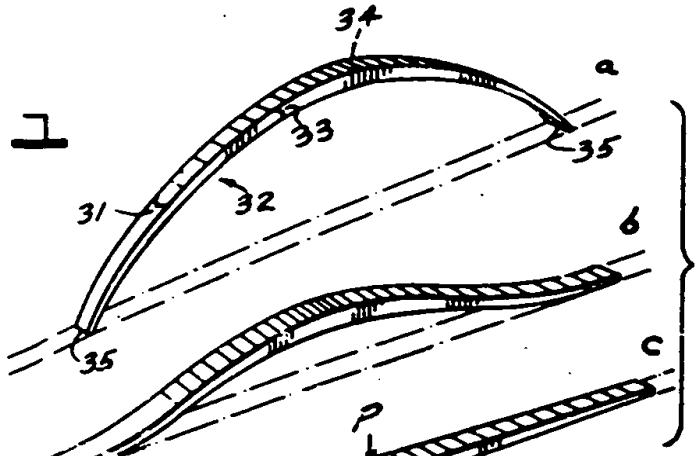


FIG. 3

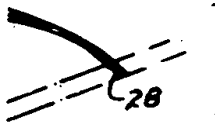


FIG. 6

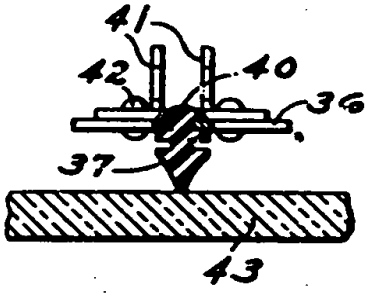
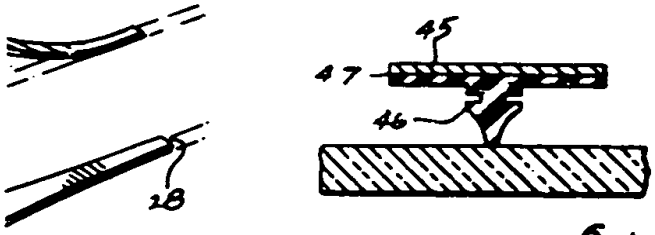


FIG. 7



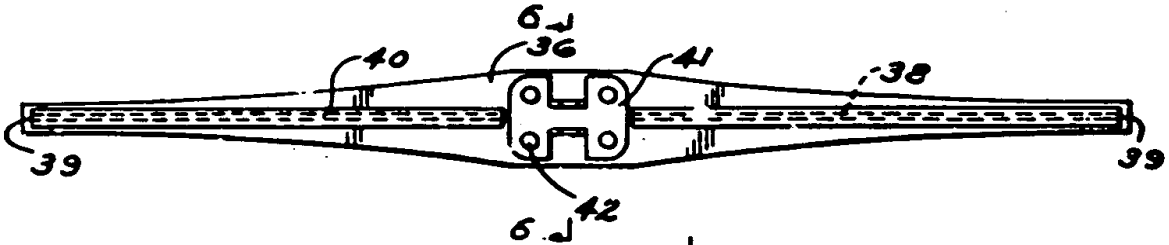


FIG. 4

FIG. 5